CHAPTER 1

# Introduction

DNA analysis is the gold standard for identification of human remains from mass disasters. Particularly in the absence of traditional anthropological and other physical characteristics, forensic DNA typing allows for identification of any biological sample and the association of body parts, as long as sufficient DNA can be recovered from the samples. This is true even when the victim's remains are fragmented and the DNA is degraded. While many effective laboratory protocols are available for DNA analysis, the analytical portion is only one part of the identification process.

Special attention is required for:

- Sample collection, preservation, shipping, and storage.
- Tracking and chain of custody issues.
- Clean, secure laboratory facilities.
- Quality assurance and quality control practices.
- Managing the work.
- DNA extraction and typing.
- Interpretation of results.
- Automation.
- Use of software for sample tracking and data management.
- Use of an advisory panel of experts.
- Public education and communication.
- Privacy issues.

Developing strategies that address these features of DNA identification will facilitate the identification process. As many of the features described in this report for DNA typing of mass disaster human remains are the same as those for missing persons cases, it may be possible to invest in and coordinate with missing persons identification efforts. Thus, the infrastructure for a mass disaster identification process could be in place and only surge capacity would need to be addressed in the event of a mass disaster.

Although this report deals with the identification of human remains through DNA analysis, other methods—including anthropology, dental records, tattoos—should be used in a mass fatality identification effort whenever possible. In fact, some of these identification modalities are so uniquely identifying that they may eliminate the need for the more labor-intensive DNA analysis, or at least minimize the need for reanalysis. (An extensive overview of forensic identification beyond DNA analysis can be found in *Mass Fatality Incidents: A Guide for Human Forensic Identification,* U.S. Department of Justice, National Institute of Justice, June 2005, NCJ 199758. The report is available at http://www.ojp.usdoj.gov/nij/pubs-sum/199758.htm.)

*Lessons Learned From 9/11: DNA Identification in Mass Fatality Incidents* is not a substitute for a comprehensive mass fatality response plan. Although the concepts explored in this report should be considered in a laboratory's mass disaster plan, the document provides only a general framework. The recommendations do not represent the only correct course of action and may not be feasible in all circumstances; details regarding implementation should be based on a laboratory's need, culture, and resources. In no case should this report be considered a legal mandate or policy directive.

After a mass fatality event, it is the job of the medical examiner to identify the victims so that death certificates can be issued. When DNA analysis is part of the identification process, the laboratory must ensure that:

- Victim, reference, and kinship samples are accessioned into the laboratory system and documented by proper chain of custody.

- DNA is extracted and genotyped, and that analysis of the genotype data, including matching and statistics, is performed.
- Samples are reaccessioned and accounted for, if they have been outsourced.
- Final administrative review—comparing the DNA results to non-DNA metadata—is conducted and, if necessary, reconciled. [Note: Metadata for a kinship sample, for example, include the kin's name, biological relationship to the victim, and when and where the sample was collected.]

This report addresses all these phases of a mass fatality DNA identification effort. It is organized by specific areas of management responsibility for the laboratory manager or director. During the World Trade Center DNA identification effort, many of the most critical management decisions were made within the first 48 hours following the terrorist attacks. This report examines many of these issues, and contains several sample forms that may be helpful. The report can be downloaded at http://www.massfatality.dna.gov. To order a hard copy or CD–ROM of the report, call 1-800–851–3420 or visit http://www.massfatality.dna.gov.

Throughout the report, members of the Kinship and Data Analysis Panel share some of their personal thoughts; please note that they are speaking for themselves, not on behalf of their employer.

The following self-assessment may help a laboratory consider whether it is ready to handle the identification of victims in a mass fatality incident. It may be helpful to complete the checklist using various numbers of samples.

## Is the Laboratory Prepared to Handle a Mass Fatality?

Number of victims _____

Number of victim samples _____

Number of personal items _____

Number of kin _____

Whom will the laboratory be reporting to?

Who is responsible for funding the DNA identification effort?

How will the victim samples be collected and tracked?

How will the samples get to the laboratory?

How many family reference collection kits are immediately available? What modifications to the kits may need to be made?

Are there written instructions for kin reference sample collection?

How will the collection of reference samples be coordinated locally, nationally, and internationally?

How will the personal reference samples and elimination samples be scheduled and collected?

Is there an adequate accessioning area to receive all samples?

Are there procedures to handle incomplete or missing data?

Is there a laboratory information management system (LIMS) in place to track cases, including victim and reference samples?

Can cases be combined or separated in the LIMS?

How will a victim be defined (as a case)?

Is there adequate staffing for each of the following?

- Collection
- Accessioning
- Extraction
- Amplification
- Analysis
- Interpretation
- Reporting
- Quality control
- Family relations
- Media relations
- New personnel

Is there sufficient space for the victim and reference samples? Are the areas separate?

Will the testing be done in-house or will some of the samples be outsourced?

If samples will be outsourced, are contracts in place that can be modified?

What modifications need to be made specific to the mass fatality? For example, how will the data be reported?

Will an advisory group be needed to provide technical support and to assist the laboratory in making major decisions?

Are there adequate extraction procedures and robotics to handle the volume? Do the parameters need to be changed for victim samples?

Can additional reagents be purchased from the same lot number already used by the laboratory?

Can the mass fatality identification effort be handled without purchasing additional equipment? Does the laboratory have the capacity?

If the lab does not have the capacity, are there procedures and policies in place to acquire equipment and consumables rapidly?

How will the generated profiles be stored?

How will the matching take place?

Is there a mechanism to review the supporting metadata for accuracy?

Is there a checklist in place?

How will reports be generated?

How will reports be issued?

How will remains and personal items be returned to the families? How will this be documented?

Does the laboratory have the financial resources to handle the identification effort?

Can the laboratory handle a backlog of its normal casework while it works on the identification effort? If so, how big can the backlog get?

Does the laboratory have kinship analysis software?

Is there a policy to handle the situation in which the genetic relationship is not consistent with the biological relationship reported by the family?

Does the laboratory have a relationship with a bioethicist?

Other_____